

WHAT IS CLAIMED IS:

1. A toner process comprising heating a mixture of an acicular magnetite dispersion, a colorant dispersion, a wax dispersion, a first latex containing a crosslinked resin, a second latex containing a resin substantially free of crosslinking, a coagulant and a silica, and wherein the toner resulting possesses a shape factor of from about 120 to about 150.

2. A process in accordance with **claim 1** wherein said silica is a colloidal silica and is incorporated into said toner by an in situ process, and wherein said shape factor is about 130 to about 140.

3. A process in accordance with **claim 1** wherein said silica is comprised of colloidal silica particles of a size diameter of from about 0.003 to about 0.08 micron.

4. A process in accordance with **claim 1** comprising
- (i) mixing said acicular magnetite dispersion containing water and an anionic surfactant, or a nonionic surfactant, and said colorant dispersion containing carbon black, water and an anionic surfactant, and optionally a nonionic surfactant, and a colloidal silica dispersion containing water and an anionic surfactant, and wherein said wax dispersion is comprised of submicron wax particles of from about 0.1 to about 0.5 micron in diameter by volume, and which wax is dispersed in water and an anionic surfactant;
 - (ii) wherein the resulting mixture is blended with said latex comprised of submicron substantially noncrosslinked resin particles of about 150 to about 300 nanometers in diameter and containing water, an anionic surfactant or a nonionic surfactant, and said crosslinked latex is comprised of submicron gel particles of about 30 to about 150 nanometers in diameter containing water and an anionic surfactant or a nonionic surfactant;
 - (iii) wherein the resulting blend possesses a pH of about 2.2 to about 2.8 to which is added said coagulant to initiate flocculation or aggregation of said resulting blended components;
 - (iv) heating the resulting mixture of (iii) below about the glass transition temperature (T_g) of the noncrosslinked latex resin to form aggregates;
 - (v) optionally adding to the formed aggregates a third latex comprised of resin suspended in an aqueous phase containing an ionic surfactant and water, and optionally stirring for a period of time to permit stabilization of the aggregate particle size;
 - (vi) adding to the resulting mixture of (v) an aqueous solution of a base to thereby change the pH, which is initially from about 2 to about 2.8, to arrive at a pH of from about 7 to about 7.5;

(vii) heating the resulting aggregate mixture of (vi) above about the T_g of the latex containing said substantially noncrosslinked resin, and allowing the pH to decrease;

(viii) retaining the mixture temperature at from about 85°C to about 95°C for an optional period of about 10 to about 60 minutes, followed by a pH reduction with an acid to arrive at a pH of about 4.2 to about 4.8, and optionally, which pH is below about the P_{zc} of said magnetite;

(ix) optionally retaining the mixture temperature at from about 85°C to about 95°C for an optional period of about 5 to about 10 hours to assist in permitting the fusion or coalescence of the toner aggregates and to obtain smooth particles;

(x) washing the resulting toner slurry; and

(xi) isolating the toner product.

5. A process in accordance with **claim 4** (viii) wherein said P_{zc} is the pH where said particles are substantially free of a positive or a negative charge.

6. A process in accordance with **claim 4** wherein said silica is a colloidal silica which forms a coating on said magnetite rendering it substantially insensitive to pH fluctuations, and optionally wherein for said magnetite the Zero Charge (P_{zc}) is rendered ineffective.

7. A process in accordance with **claim 4** wherein the pH of (viii) is reduced to about 4.5, which pH is lower than the P_{zc} of the uncoated magnetite at pH of 5.3 without any significant change in the toner particle size.

8. A process in accordance with **claim 1** wherein said silica comprises silicon dioxide (SiO_2) and a stabilizing counterion of sodium, potassium or ammonium ions, and said coagulant is a polymetal halide.

9. A process in accordance with **claim 1** wherein said silica is comprised of silicon dioxide (SiO_2) and sodium ion oxide (Na_2O), and wherein the $\text{SiO}_2\text{:Na}_2\text{O}$ weight ratio is from about 100:1 to about 1,000:1.

10. A process in accordance with **claim 1** wherein about 75 to about 95 percent of said silica, introduced in the form of a silicate, is retained in said toner.

11. A process in accordance with **claim 1** wherein said coagulant is selected from the group consisting of polyaluminum chloride (PAC), polyaluminum sulfo silicate (PASS), aluminum sulfate, zinc sulfate, and magnesium sulfate.

12. A process in accordance with **claim 11** wherein about 80 to about 90 percent of said coagulant metal ion is retained in said toner

13. A process in accordance with **claim 1** wherein said colorant is carbon black, and wherein said carbon black dispersion comprises carbon black particles dispersed in water and an anionic surfactant, and wherein said carbon black is present in an amount of from about 4 to about 10 weight percent.

14. A process in accordance with **claim 1** wherein the amount of acicular magnetite selected is from about 20 to about 40 percent by weight of toner, and said coagulant is comprised of a polymetal halide present in an amount of about 0.02 to about 2 percent by weight of toner, and optionally, further a second cationic surfactant coagulant is present in an amount of about 0.1 to about 5 percent by weight of toner.

15. A process in accordance with **claim 1** wherein the amount of acicular magnetite selected is from about 23 to about 35 percent by weight of toner, and wherein the coagulant is a polymetal halide selected in an amount of about 0.05 to about 0.15 percent by weight of toner.

16. A process in accordance with **claim 1** wherein said acicular magnetite exhibits a coercivity of from about 250 to about 700 Oe.

17. A process in accordance with **claim 1** wherein said acicular magnetite possesses a coercivity of from about 250 to about 500 Oe, a remanent magnetization (Br) of about 23 to about 39 emu/gram, and a saturation magnetization (Bm) of about 70 to about 90 emu/gram, and optionally wherein said acicular magnetite is present in said toner in an amount of from about 10 to about 40 weight percent.

18. A process in accordance with **claim 1** wherein the toner exhibits a magnetic signal of about 90 to about 150 percent of the nominal where the nominal is a signal strength of about 100 percent.

19. A process in accordance with **claim 1** wherein the crosslinked resin contains resin particles of from about 0.15 to about 0.4 micron in volume average diameter, and said second latex contains a resin free of crosslinking.

20. A process in accordance with **claim 1** wherein said magnetite is from about 0.6 micron to about 0.1 micron in average volume diameter, and said colorant is carbon black, and said carbon black is from about 0.01 to about 0.2 micron in average volume diameter.

21. A process in accordance with **claim 4** wherein said acid is nitric, sulfuric, hydrochloric, citric or acetic acid, and said coagulant is a polyaluminum chloride, and optionally wherein there is added to the formed toner aggregates of (v) said (third) latex comprised of submicron resin particles suspended in an aqueous phase containing an anionic surfactant, and wherein said second latex is selected in an amount of from about 10 to about 40 percent by weight of the initial latex (i) to form a shell thereover on said formed aggregates, and which shell is of an optional thickness of about 0.2 to about 0.8 micron.

22. A process in accordance with **claim 4** wherein the pH of the mixture resulting in (vi) is increased from about 2 to about 2.6 to about 7 to about 7.2, and wherein said silica originating from silicate salt dissolved in a base functions primarily as a stabilizer for the aggregates during coalescence (vii), and minimal toner particle size increase results, and wherein said coagulant is a polymetal halide.

23. A process in accordance with **claim 4** wherein the aggregation (iv) temperature is from about 45°C to about 60°C, and wherein the coalescence or fusion temperature of (vii) and (viii) is from about 85°C to about 95°C.

24. A process in accordance with **claim 1** wherein said first or said second latex resin is selected from the group comprised of poly(styrene-alkyl acrylate), poly(styrene-1,3-diene), poly(styrene-alkyl methacrylate), poly(alkyl methacrylate-alkyl acrylate), poly(alkyl methacrylate-aryl acrylate), poly(aryl methacrylate-alkyl acrylate), poly(alkyl methacrylate), poly(styrene-alkyl acrylate-acrylonitrile), poly(styrene-1,3-diene-acrylonitrile), poly(alkyl acrylate-acrylonitrile), poly(styrene-butadiene), poly(methylstyrene-butadiene), poly(methyl methacrylate-butadiene), poly(ethyl methacrylate-butadiene), poly(propyl methacrylate-butadiene), poly(butyl methacrylate-butadiene), poly(methyl acrylate-butadiene), poly(ethyl acrylate-butadiene), poly(propyl acrylate-butadiene), poly(butyl acrylate-butadiene), poly(styrene-isoprene), poly(methylstyrene-isoprene), poly(methyl methacrylate-isoprene), poly(ethyl methacrylate-isoprene), poly(propyl methacrylate-isoprene), poly(butyl methacrylate-isoprene), poly(methyl acrylate-isoprene), poly(ethyl acrylate-isoprene), poly(propyl acrylate-isoprene), poly(butyl acrylate-isoprene); poly(styrene-propyl acrylate), poly(styrene-butyl acrylate), poly(styrene-butadiene-acrylonitrile), and poly(styrene-butyl acrylate-acrylonitrile).

25. A process in accordance with **claim 24** wherein said resin contains a carboxylic acid selected from the group comprised of acrylic acid, methacrylic acid, itaconic acid, beta carboxy ethyl acrylate, fumaric acid, maleic acid, and cinnamic acid, and optionally wherein said carboxylic acid is selected in an amount of from about 0.1 to about 10 weight percent.

26. A process in accordance with **claim 1** wherein said coagulant is a polymetal halide of a polyaluminum chloride, a polyaluminum sulfosilicate, or a polyaluminum sulfate, and there is further added to the mixture a second cationic surfactant coagulant of an alkylbenzyl dimethyl ammonium chloride.

27. A process in accordance with **claim 1** wherein said wax dispersion contains a polyethylene, polypropylene, water, and an anionic surfactant, and wherein said wax is selected in an amount of from about 5 to about 20 weight percent.

28. A process comprising heating a mixture of an acicular shaped magnetite dispersion, a black colorant dispersion, a crosslinked resin latex, a latex containing a resin free of crosslinking, and a coagulant, and wherein said heating involves a first heating and subsequently a second heating, and which second heating is at a higher temperature than said first heating, said second heating being above about the glass transition temperature (T_g) of said resin free of crosslinking.

29. A process in accordance with **claim 1** wherein said first latex contains a crosslinked resin of a poly(styrene butylacrylate, beta carboxy ethyl acrylate divinyl benzene).

30. A process in accordance with **claim 1** wherein said resin free from crosslinking possesses a molecular weight M_w of about 20,000 to about 500,000, and an onset glass transition (T_g) temperature of from about 45°C to about 55°C, wherein said first latex crosslinked resin is selected in an amount of from about 1 to about 40 weight percent, and said resin possesses a molecular weight M_w of from about 100,000 to about 1,000,000, and an onset glass transition (T_g) temperature of about 48°C to about 58°C, and wherein said crosslinked resin latex is selected in an amount of from about 2 to about 15 weight percent, said latex free of a crosslinked resin is selected in an amount of from about 40 to about 65 weight percent, said magnetite is selected in an amount of from about 20 to about 35 weight percent, said wax is selected in an amount of from about 5 to about 15 weight percent, and wherein the total thereof of said components is about 100 percent based on said toner.

31. A process comprising heating a magnetite, a latex containing a crosslinked polymer, a latex containing a polymer substantially free of crosslinking, a coagulant, and a colloidal silica, and wherein said heating involves a first heating equal to about or below about the T_g of said resin free of crosslinking, and a second heating equal to about or above about the T_g of said resin free of crosslinking.